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telescope must have been an uncommonly sensitive and well-behaved attachment, the name of the maker of which should not be concealed. It cannot be that these measurements are in any degree doubtful, for, otherwise, Mr. Taylor would hardly use them, as he has, in computing the constant of his instrument, in which operation he carries results to eight significant figures, the unit of the last place in his final mean standing for about *one part in thirty millions*. A 'sudden drop' is experienced, however, in the very next paragraph, where he says that the same calculation has been made by other people and by a different method, resulting in a quantity differing from the former by about one part in five or six hundred, and which he proceeds to use instead of the result of his own labors.

But it is not in linear measurement alone that marvelous skill is shown in this piece of work. There is weighing which must also excite admiration. A movable coil of the same kind of wire, which must have weighed not much less than a kilogram, was suspended from the arm of a balance; and the 'pull' on this coil, amounting, it is inferred from the tables, to about 23 grams in one case and about 45 grams in another, was weighed to within one-tenth of a milligram. This, of itself, is not, perhaps, remarkable, but it becomes so when it is remembered that this coil is anchored to solid ground by two thin slips of 'crimped' sheet copper, 7 mm. in width. The getting of a tenth of a milligram under such conditions implies rare skill. But the reader is again doomed to bitter disappointment when he is informed that the result of all this exquisite work is to give a value for the E. M. F. of a Clark cell differing from all of the many good determinations that have been made before by more than one part in two hundred and fifty or nearly one-half of one per cent., and that the author himself concludes that, as absolute measurements, his results 'don't count.'

'Figuratively speaking,' Mr. Taylor's paper is, or ought to be, almost unique, but it is only justice to him to add that it really contains much that is interesting and valuable from points of view other than that of metrology.

X.

#### LIFE-ZONES IN NEW MEXICO.

A NEW bulletin by Dr. C. H. Merriam has just come to hand from the Department of Agriculture, entitled 'Life-Zones and Crop-Zones.' It contains a colored map showing the zones, and a great deal of valuable information about the agricultural products of each zone. On p. 13 it is stated:

"The colored maps prepared by the Biological Survey furnish the first rational basis the American farmer and fruit grower has ever had for the intelligent distribution of seeds and the only reliable guide he can find in ascertaining beforehand what crops and fruits are likely to prove successful on his own farm, wherever it may be located."

On p. 7 it is stated that "great care has been taken to make the lists accurate and trustworthy as far as they go." Also, "the intention in the present report is to omit doubtful records."

On p. 42 we find these words: "Raisins and wine grapes, oranges, lemons, olives, prunes, peaches, apricots, English walnuts and almonds are among the important products of the Lower Sonoran area, and the fig ripens several crops each year." Immediately following is a list of the crops of the Lower Sonoran, including even guavas and the loquat, among a variety of other things.

On p. 41 it is said that the Lower Sonoran "sends an arm northwest to a point a little north of Albuquerque, New Mexico. Another arm reaches up the valley of the Pecos." The map shows these arms, the Pecos valley one going about to Eddy. These arms are colored as typical Lower Sonoran, and no word appears in the text to suggest otherwise.

On pp. 15-17 the special value of these arms is insisted upon, because "by growing particular crops at points remote from the usual sources of supply, and at the same time conveniently near a market, the cost of transportation is greatly reduced and the profit correspondingly increased."

After all this, the reader will be surprised to learn that heavy frosts occur annually in the supposed Lower Sonoran arms in New Mexico, and that the cultivation of oranges, lemons or olives is totally out of the question anywhere within the bounds of the Territory. The fig,

so far from ripening several crops annually, is killed down every winter, except in sheltered places, as between four walls, and does not produce any crop unless thus protected. In short, the products of the Rio Grande and Pecos valleys in New Mexico are *Upper Sonoran*, not Lower Sonoran at all, although it is true that there are some elements in the fauna and flora which may even be called neotropical.

These facts are not new, nor is this criticism of Dr. Merriam's map here made for the first time. In the plainest possible language, I drew attention to the real status of the case in Bull. 15, of the N. M. Experiment Station, January, 1895, pp. 54, 55. Again I protested against Dr. Merriam's mapping in Bull. 17 of the same station, April, 1896, p. 100. Still again the subject was discussed in Bull. 24 of the same station, August, 1897, p. 7, etc. In the publication last cited are quotations from an excellent letter by Dr. T. S. Palmer, of the Biological Survey, admitting that the products assigned to the Lower Sonoran do not grow all over that area as mapped; but in the work now criticised there is no hint of this.

Professor C. H. T. Townsend, who has long studied the distribution of life in New Mexico, has also expressed himself clearly and explicitly on the point at issue. He further explains the limits of the Lower Sonoran in Arizona, Mexico and Texas, on pp. 84, 85 of his paper in the Proceedings of the Texas Academy of Science, vol. 1. In a second paper in the same Proceedings he has further discussed the fauna and flora of Mexico and the southwestern United States, giving many new facts and arguments.

Neither Professor Townsend nor the present writer imagine that we are within a measurable distance of reaching final conclusions on zone-distribution in the West; but the facts mentioned above, ignored by Dr. Merriam, are matters of common knowledge to every inhabitant of this region. Certain persons interested in the sale of lands have from time to time circulated false statements as to the products of southern New Mexico, which statements have been duly corrected. But now, for their most extravagant assertions, they can fall back on the authority of the Chief of the Biological Survey!

We all owe thanks to Dr. Merriam for the

large amount of extremely valuable work he has accomplished during the last ten years, but this fact cannot protect him from criticism when he deliberately reissues misleading statements and maps, totally ignoring the protests of those who are working in the region discussed. He not only perpetuates a scientific error, but runs the risk of seriously misleading those farmers whom he invites to guide their operations by his aid.

T. D. A. COCKERELL.

MESILLA PARK, N. M.,  
September 22, 1898.

MR. COCKERELL finds fault with me for including certain parts of the valleys of the Rio Grande and Pecos in the Lower Sonoran Zone, and makes the positive statement that they are in the Upper Sonoran Zone. At the same time he admits that the faunas and floras of these valleys are mixtures of at least two zones. In this I quite agree with him. He considers the preponderance of species Upper Sonoran; I considered it Lower Sonoran. The difference between us, therefore, relates to the position of the boundary line—a line separating adjoining belts in a narrow valley. He thinks I have carried it too far north. He may be right. But he omits to quote from my Bulletin an important statement intended to cover this class of cases. In discussing the northern arms of the Carolinian faunal area I said: "These arms, like nearly all narrow northward prolongations of southern zones, do not carry the complete faunas and floras of the areas to which they belong, but lack certain species from the start and become more and more dilute to the northward till it is hard to say where they really end. Their northern boundaries must be drawn arbitrarily, or must be based on the presence or absence of particular species rather than the usual association of species."

This seems to dispose of the main point of Mr. Cockerell's criticism. The absurd claim that all the crops mentioned as growing in a particular zone will grow in all parts of that zone has never been made by me. And as to the map, it seems hardly necessary to say that one on so small a scale as that accompanying the paper in question can hardly be expected to

show the degree of purity and extent of overlapping of contiguous parts of adjoining belts.

In conclusion, I beg to express the hope that my protracted absence in remote parts of the West, while engaged in tracing the boundaries of the life zones, may ameliorate my offense in not having seen all of Mr. Cockerell's writings.

C. HART MERRIAM.

SAN FRANCISCO, CAL., October 11, 1898.

#### SCIENTIFIC LITERATURE.

*Angewandte Elektrochemie.* Zweiter Band: Anorganische Elektrochemie. Dritter Band: Organische Elektrochemie. Von DR. FRANZ PETERS. Hartleben's Verlag, Wien; Pest, Leipzig.

The first volume of this book was reviewed in SCIENCE by Professor Smith (April 9, 1897). In the light of this notice of the general purport of the book by so able an authority, attention need only be called to the appearance of the subsequent volumes and to their contents. The second volume, on the electro-chemistry of inorganic substances, is divided into two parts. The first deals with the electro-chemistry of the metalloids and alkali metals, including methods of obtaining hydrogen, of purifying water, of obtaining chlorine, bromine and iodine, oxygen and ozone, arsenic and antimony. It is interesting to note under carbon that it volatilizes at about 3,600° in the arc of the electric lamp, and that Moissan has succeeded in converting it into vapor in the electric furnace. It did not, however, assume the liquid state, but passed at once into vapor. The beautiful work of Moissan on highly heated carbon is taken up at some length. The electrolytic separation of lithium and sodium is then taken up, the methods of Grabau, Borschers and Castner in the production of sodium receiving special treatment.

The second part of the second volume is devoted to the alkaline earths, the earths and heavy metals.

The third volume deals entirely with the electro-chemistry of organic compounds. The extent to which organic compounds can be prepared by the action of the current is shown by the number of classes of substances included in this volume. In the paraffin series there are

thirteen classes, including hydrocarbons, alcohols, ether, ethereal salts, acids. In the aromatic series there are seventeen classes, including hydrocarbons, nitro, sulphur and amine derivatives of the hydrocarbons, phenols, alcohols, aldehydes, ketones and acids. This volume closes with an account of some of the practical uses of organic electro-chemistry, as electrolye, electropainting, electroplating, etc.

Insofar as it deals with the electrolytic deposition of the metals, this book covers some of the same ground as the well known work of Borschers, which deals with electro-metallurgy in such a masterly manner. But the work of Peters covers a much wider field, and will doubtless prove to be a valuable contribution to practical electro-chemistry.

H. C. J.

*Up-to-date Air-brake Catechism.* By ROBERT H. BLACKALL, Air-Brake Inspector and Instructor on the D. & H. Ry. New York, N. W. Henley & Co. 12mo. Pp. 230. Illustrated.

This is a little book, but one of great value in a special field. It is the custom of the makers of air-brakes, and of the management of the best railway systems, to employ an inspector and instructor to go from point to point on the railways, inspecting the brake outfit and teaching its use, as experts. The plan is an admirable one and undoubtedly a most valuable insurance of safety to the traveling public as well as to employees. Mr. Blackall is one of these instructors and inspectors who, with rare discretion, tact and expert knowledge, has written out his instructions in this catechetical form and printed it.

The book is not only unique in its subject, in its completeness and in its comprehensiveness; but it is one which evidences in its plan, in its literary form and in detail, the talent and culture of a man of education, as well as of professional competence. Before January 1, 1900, every train must have sufficient air-brake equipment to control it, and this means the education and training of an army of railroad men of all grades; hence the value of this timely text-book. It includes a discussion of